

AMENDMENTS TO THE CLAIMS

This listing of claims replaces all prior versions, and listings, of claims in the application.

Claims 1-7 (Cancelled).

8. (Currently Amended) ~~The A refrigerator as claimed in claim 1~~ comprising:
a first compressor for compressing carbon dioxide as a first coolant;
a radiator for radiating heat from the first coolant;
a first flow control valve for regulating flow volume of the first coolant;
a first evaporator for evaporating the first coolant;
coolant cooling means for cooling the first coolant and including:
 a second compressor for compressing a second coolant having an energy
consumption efficiency higher than that of the first coolant;
 a condenser for radiating heat from the second coolant;
 a second flow control valve for regulating flow volume of the second
coolant; and
 a second evaporator for evaporating, with heat from the first coolant, the
second coolant; and
 heat-exchange-amount control means for controlling quantity of heat
exchanged in the coolant cooling means, wherein
 the heat-exchange-amount control means includes:
 drying-ratio estimation means for estimating, ~~by~~ from a value
measured ~~value~~ using a sensor, a drying ratio between drying rate of the first coolant
exiting the first flow control valve and drying rate when the first coolant exiting the
~~first~~ radiator is decompressed to its evaporation temperature;
 drying-ratio control-range determination means for determining a

control range of the drying ratio, so that a coefficient of performance (COP) value is obtained, in which the difference between the COP value and the maximum COP value obtained when the drying ratio is varied under predetermined operational conditions is within a predetermined range₃, and

control means for controlling the quantity of heat exchanged in the coolant cooling means, so that the drying ratio estimated by the drying-ratio estimation means is within the control range;

the first coolant is circulated through the first compressor, the radiator, the coolant cooling means, the first flow control valve, and the first evaporator, in that sequence; and

the second coolant is circulated through the second compressor, the condenser, the second flow control valve, and the second evaporator, in that sequence.

9. (Currently Amended) ~~The A refrigerator as claimed in claim 1~~ comprising:

a first compressor for compressing carbon dioxide as a first coolant;

a radiator for radiating heat from the first coolant;

a first flow control valve for regulating flow volume of the first coolant;

a first evaporator for evaporating the first coolant;

coolant cooling means for cooling the first coolant and including:

a second compressor for compressing a second coolant having an energy consumption efficiency higher than that of the first coolant;

a condenser for radiating heat from the second coolant;

a second flow control valve for regulating flow volume of the second coolant; and

a second evaporator for evaporating, with heat from the first coolant, the second coolant; and

heat-exchange-amount control means for controlling quantity of heat exchanged in the coolant cooling means, wherein

the heat-exchange-amount control means includes:

drying-ratio estimation means for estimating, ~~by~~ from a value ~~measured-value~~ using a sensor, a drying ratio between drying rate of the first coolant exiting the first flow control valve and drying rate when the first coolant exiting the ~~first~~ radiator is decompressed to its evaporation temperature₁;

drying-ratio control-range determination means for determining a control range of the drying ratio, so that a coefficient of performance (COP) value is obtained, in which the difference between the COP value and the maximum COP value obtained when the drying ratio is varied under predetermined operational conditions is within a predetermined range₁; and

control means for controlling the flow volume of the second coolant flowing in the coolant cooling means, so that the drying ratio estimated by the drying-ratio estimation means is within the control range;

the first coolant is circulated through the first compressor, the radiator, the coolant cooling means, the first flow control valve, and the first evaporator, in that sequence; and

the second coolant is circulated through the second compressor, the condenser, the second flow control valve, and the second evaporator, in that sequence.

10. (Currently Amended) The refrigerator as claimed in claim 8, wherein the sensor includes:

at least one of first pressure-measuring means for measuring pressure of the first coolant between exiting the first flow control valve and entering the first evaporator, and first temperature-measuring means for measuring temperature of the first coolant exiting the first flow control valve;

second pressure-measuring means for measuring pressure of the first coolant between the first compressor and the first flow control valve;

second temperature-measuring means for measuring temperature of the first coolant entering the first flow control valve; and

third temperature-measuring means for measuring temperature of the first

coolant exiting the ~~first~~ radiator.

11. (Withdrawn-Currently Amended) The refrigerator as claimed in claim 8, wherein the sensor includes:

first temperature-measuring means for measuring temperature of the first coolant exiting the first flow control valve;

second temperature-measuring means for measuring temperature of the first coolant entering the first flow control valve;

third temperature-measuring means for measuring temperature of the first coolant exiting the ~~first~~ radiator;

fourth temperature-measuring means for measuring temperature of the first coolant entering the ~~first~~ radiator; and

fifth temperature-measuring means for measuring temperature of the first coolant entering the first compressor.

Claims 12-15 (Cancelled).

16. (Currently Amended) The refrigerator as claimed in claim 8, further comprising at least one of ~~first~~ pressure-measuring means for measuring pressure of the first coolant between exiting the first flow control valve and entering the first evaporator, and ~~first~~ temperature-measuring means for measuring temperature of the first coolant exiting the first flow control valve, wherein the drying-ratio control-range determination means determines a control range of the drying ratio, using either the pressure of the first coolant measured by the ~~first~~ pressure-measuring means or the temperature of the first coolant measured by the ~~first~~ temperature-measuring means.

17. (Currently Amended) The refrigerator as claimed in claim 8, further comprising ~~second~~ pressure-measuring means for measuring pressure of the first coolant between exiting the ~~first~~ radiator and entering the first flow control valve,

wherein the drying-ratio control-range determination means determines a control range of the drying ratio, using the pressure of the first coolant measured by the ~~second~~ pressure-measuring means.

Claims 18-28 (Cancelled).